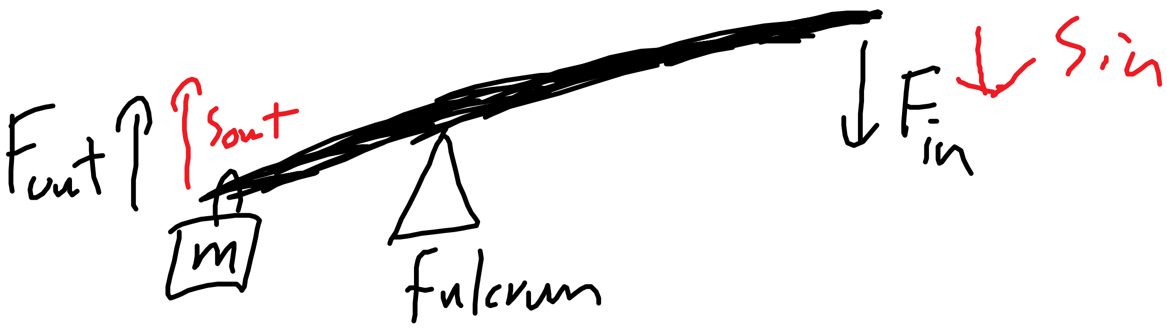
Tuesday, January 03, 2017 10:17 AM

Work, Power and efficiency
Simple machines
- pulleys, inclined plane, wedge, levers, wheel and axel

you apply a force and another force results
input force and the output force

look at a simple lever



Work, $W = Fs$

ideal machine, no work lost - energy wasted in friction as heat.
Work in = work out

$F_{in} S_{in} = F_{out} S_{out} \longrightarrow \frac{F_{out}}{F_{in}} = \frac{S_{in}}{S_{out}}$

Mechanical Advantage, $MA = \frac{F_{out}}{F_{in}}$

ideal MA = $\frac{F_{out}}{F_{in}} = \frac{S_{in}}{S_{out}}$ Fin

eg. you are lifting a car, so you need to have an output force of 2.0 kN and move it 0.10m.
700kg x 9.81N/kg /4wheels
700x9.81/4=1,716.75
You use a lever (jack) Your hand moves through 1.5m (multiple pushes).

a) what is the ideal mechanical advantage of the jack?
b) what is the minimum force you need to apply if the jack is ideal?
c) If the force required is 150N, what is the mechanical advantage and efficiency of the jack?

efficiency = Wout/Win x 100%

a) IMA = Fout/Fin = sin/sout = 1.5m/0.10m
15 (no units) sometime 15X
b) IMA = Fout/Fin Fin= Fout/IMA =
2000N/15 = 133N
c) MA=Fout/Fin = 2000N/150N = 2000/150=
13.3333 = 13X

efficiency = Wout/Win x 100%
= Foutxsout/Finxsin x 100%
= 2000Nx0.10m/150Nx1.5m x 100%
(2000x0.1)/(150x1.5)=0.8889
89%

Homework : p199-203 problems 1-6 and 9-12 (angles next year)